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A CERAMIC MURAL
ITS DESIGN AND CONSTRUCTION

by

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B. S. UNIVERSITY OF MINNESOTA, 1937

Presented in partial fulfillment of the requirements for the degree
Master of Arts in Art

MONTANA STATE UNIVERSITY

1960

Approved by:



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Dean, Graduate School

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CHAPTER I

THE PROJECT

Early in the fall quarter of the 1959-60 school year, Mr. A. Rudy Autio, Assistant Professor of Art at Montana State University, suggested the possibility of constructing a ceramic mural for the Fellowship Room of the Immanuel Lutheran Church of Missoula, Montana. The Reverend Roderick W. Johnson, pastor of the church, had stated that the church wished to have such a mural.

An interview with the Reverend Johnson and an inspection of the Fellowship Room indicated that a project of this type was entirely feasible and held many possibilities for experimentation and research.

The design and execution of a ceramic mural necessitates the consideration of a number of factors not usually encountered by an artist producing an isolated or moveable work. The mural, due to its fixed position and its permanence, becomes a part of the architecture and must be treated as such. The use or function of the room is also an important influence in deciding the type of the design as well as the scale of the work. Subject matter, in the way of symbolism or illustration, is fairly dependent upon the use of the room and the wishes of a sponsoring organization. Finally, there is the ceramic medium itself. Its possibilities and limitations affect the treatments and styles to be considered by the artist. This paper presents the architectural, functional, aesthetic, and religious factors considered in formulating the design together with the technical methods used to construct the ceramic mural.

I. THE ARCHITECTURAL CONSIDERATIONS

The Immanuel Lutheran Church, located at 830 South Avenue West, Missoula, Montana, was built in 1955. The building, contemporary in style, was designed by the architectural firm of Fox, Ballas and Barrow. The exterior is of wood and stone (see Figure 1, page 3) with pleasing contrasts in the architectural forms, the textures of the materials, and the color emphasis in the use of blue, red, and yellow panes of glass in the window areas. The interior treatment is consistent with the exterior, the emphasis being on utilizing wood to point up the linear elements. Copper appears in the chancel and choir areas in contrast to the green tones employed in the upholstered pews and small areas of plaster.

The Fellowship Room, located under the choir balcony, extends across the rear of the nave (see Figure 2, page 4). A division between the two areas is effected by Modernfold doors made of a light tan plastic material. The room itself is quite long and narrow; the dimensions are fourteen feet by thirty-eight feet. The west wall is the location for the mural. Windows cover the entire north wall of the room. The east end contains a small kitchen unit and a door opening into the narthex. The beamed ceiling slants from nine feet, two inches, on the south to eleven feet, two and one-quarter inches, on the north or window side. Thus the area for the ceramic mural is irregular in shape (see Figure 3, page 4). The width is thirteen feet, ten and one-half inches, while the height, minus the width of the baseboard, changes from eight feet, ten and one-quarter inches, to ten feet, ten and



FIGURE I

EXTERIOR VIEW OF IMMANUEL LUTHERAN CHURCH,
MISSOULA, MONTANA



FIGURE 2

FELLOWSHIP ROOM, IMMANUEL CHURCH



FIGURE 3

WEST WALL, INCLUDING PARTIAL VIEW
OF NAVE AREA

one-half inches. The room colors are the soft greens of the walls and draperies, the muted brown tones of the woodwork and beams, and the neutral colors of the tile floor. The mural area is lighted by fluorescent tubes parallel to and between the ceiling beams and/or the north windows. An altar of approximately forty-two inches in height is to be placed in front of the mural wall.

The room is now used for after-service fellowship and meetings. After the altar is installed, the room will be used as a chapel for small weddings as well as for meetings and other services.

II. THE RELIGIOUS CONSIDERATIONS

When the theme of the mural was discussed with the Reverend Johnson, several possibilities were mentioned dealing with Bible or Church history. The "Here I Stand" moment from the life of Martin Luther was selected as the subject for the design because of the drama of the incident and its importance in the history of the Lutheran Church and the Reformation.

On April 18, 1521, the second hearing for Martin Luther before the Diet of Worms took place. The lonely monk stood before the assembled men of power: the emperor, the German princes, and the papal representatives from the Vatican. Luther refused to recant and uttered these words which have maintained their dramatic import through the ages: --"I will not, I cannot recant. Here I stand. I can do no other. God help me! Amen!"¹

¹Herbert J. Gezork, "The Future Belongs to Freedom", Lutheran Herald. Vol. 43, No. 43, (Oct. 27, 1959), pp 1-5.

III. POSSIBILITIES AND LIMITATIONS OF THE CERAMIC MEDIUM

Ceramic tile as the medium for the construction of the mural was chosen because of the potential inherent in clay itself and the possibilities for experimentation and research in an art medium of contemporary interest. Clay is an earth material and in its fired form is harmonious with the wood and stone elements predominant in the church building. It is a permanent material, hence particularly suited to mural use, capable of being treated artistically with regard to form, color, and texture. The ceramic medium has been used with a wide range of expression, even before the beginning of recorded civilization, to fulfill practical needs and to express spiritual feelings of man.

A thorough consideration of the possibilities and limitations of the medium of clay was necessary before any extensive development of the design could take place.

It was desired to exploit the natural beauty of the fired clay for its own qualities as much as possible. Warmth of color was obtained through the choice of the materials used in the basic clay mix. The engobe colors were developed to augment rather than cover the surface quality of the medium. Texture variations were achieved by contrasting treatment of the surfaces with tools as well as by the roughness of the sand in the clay body. A type of relief modeling possible only in clay was used for further emphasis and contrast.

There are limitations in the use of fired clay which had to be considered even as the project was begun. After the proper clay body to fulfill the technical as well as the artistic qualifications had

been worked out, a nine inch square, three-quarters inch thick, tile was selected as the construction unit. This size tile would produce a comparatively light-weight wall without being subject to much warpage in drying and firing and would still have enough thickness to allow surface modeling.

In working with the ceramic medium there are certain variables difficult to predict which occur during drying, glazing, and firing. A maximum amount of control of these operations was secured through testing and experimentation before the actual construction was begun.

CHAPTER II

CREATION OF THE DESIGN

After careful consideration of the factors influencing the design and construction of the Luther mural as presented in Chapter I, two special implications were apparent. The first was to render the design in a manner which would be consistent with the architectural appearance of the building and the function of the room. The second was to treat the subject matter in a way which would be approved by and meaningful to the congregation of the church. Accordingly, it was decided that a modeled and textured, low-relief mural, designed in a fairly representational style, which would harmonize with the color and style of the Fellowship Room would be the best solution to the problem.

I. PRELIMINARY VISUAL SKETCHES

The irregular shape of the wall area was the main consideration dealt with in beginning to formulate the design. In addition, the proposed installation of an altar in front of the wall made necessary the execution of a design which would take into account the space to be occupied by the altar. Thumbnail sketches indicating figure groupings were made (see Figure 4, page 9) exploring many possible interpretations. Several of these preliminary sketches were selected for further development.

II. DEVELOPED DESIGN

The first completed design (see Figure 3, page 11) did not consider the altar area or the flower elements in the same spirit related closely to the wall space. These elements, the size of the top of the folding screen and the window, had to be utilized because the



FIGURE 4

PRELIMINARY STUDIES FOR LUTHER WALL

II. DEVELOPED DESIGNS

The first completed design (see Figure 5, page 11) did not consider the altar area or the linear elements in the room which relate closely to the wall area. These elements, the line of the top of the folding doors and the window lines, have to be utilized because the room is fairly narrow, and these strong direction indicators converge on the wall itself. The figure groupings in this first design were weak while the figure of Luther was too undramatic in itself to emphasize the importance of the incident. The colors used, however, were felt to be fairly consistent with the overall character of the room. The use of textured surfaces, as indicated, could be further explored.

In the second design (see Figure 6, page 11) the figure of Luther was strengthened and the architectural considerations of the room and the proposed altar were incorporated into the overall dimensions of the design area. At this point it had been established that the entire wall would be covered with ceramic tile. The background areas would be lightly textured and toned with pale colors.

In this design it was attempted to be more linear in the presentation of the figures. Several groupings became a solid figure area leading from both sides toward the main figure of Luther. Space and perspective, which were not desired, began to assume importance in this version.

This design did not have enough feeling of unity or consistency with the irregular dimensions of the wall area though it did consider the other architectural elements involved. There was too much monotony



FIGURE 5

FIRST DESIGN FOR LUTHER WALL

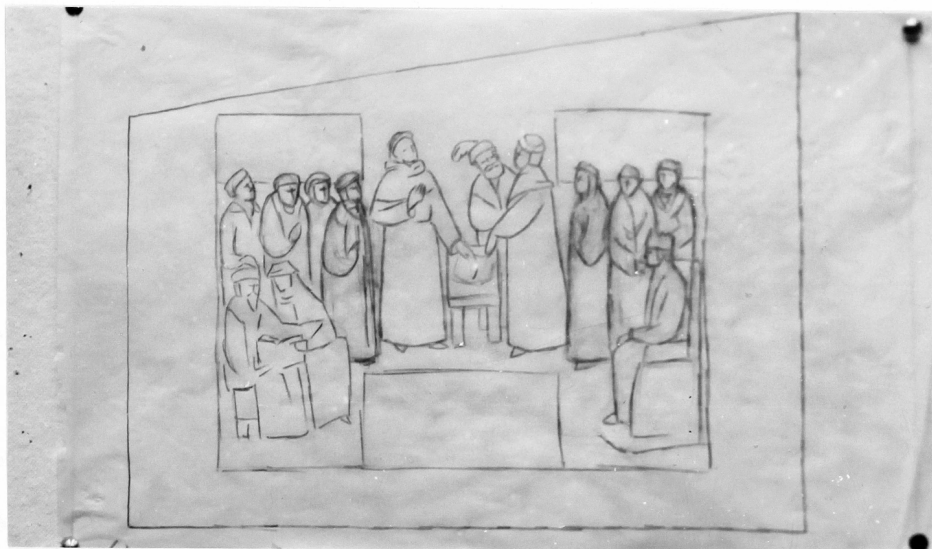


FIGURE 6

SECOND DESIGN FOR LUTHER WALL

in the line-up of the figures, which gave no particular emphasis to Luther. These faults were discovered and the design was not carried to completion.

III. ACCEPTED DESIGN

The final design (see Figure 7, page 13) has solved the problems encountered in the earlier treatments. The figure of Luther has assumed its demanded importance through the strength of the form itself, by position in relation to the other figures and to the mural as a whole, and by the movement within the figure brought about by gesture and line. Further emphasis developed in the modeling of the face and figure when the clay tiles were being worked.

The remaining figures were fairly closely grouped to convey the overall flat character of the wall and the psychological import of many in opposition to one. They were varied somewhat in position to give interest and relief and, at the same time, kept less important than the Luther figure. The use of equivocal space also helped to unify the design of the figures. Liberties for the sake of pattern and arrangement were taken with the costumes, but on the whole they remain indicative of the period in history which they represent. These figures developed considerably in design and character as they were executed in clay.

The design became a rather formal arrangement of figures but was relieved through the use of background areas, varied in size but related to each other through shape, texture, and color in the final version. These background areas were also used to unify the design as a whole and relate it to the architectural elements of the room as well as the irregular wall shape.

IV. EXPERIMENTS WITH MODELING, TEXTURE, AND COLOR

When the design had been accepted, it was then felt that some additional experiments in clay and the various techniques of texture modeling, and the colors to be used was necessary. Since the final



FIGURE 7

FINAL DESIGN FOR LUTHER WALL

IV. EXPERIMENTS WITH MODELING, TEXTURE, AND COLOR

When the design had been accepted, it was then felt that some additional experimenting in clay with the various techniques of texture, modeling, and the colors to be used was necessary. Since the line drawings could not explore the lighting effects on the relief areas, careful consideration had to be given to this aspect to obtain the maximum benefit to the design.

Texture, developed by pressing or marking the clay surface with various common objects--nails, screws, combs, and wooden blocks--added to the general appearance and interest in the design. Color areas were broken up without losing the color area itself, emphasis was obtained through the contrast of textured and smooth surfaces, and certain areas were moved forward or backward in space through the manipulation of color and texture.

After considerable experimentation one set of six tiles, depicting the head of Luther, was completed (see Figure 8, page 15) and fired as a final test.

V. FULL SCALE CARTOON

The next step in the project was to draw a full scale cartoon to be used as a working model for making the tracing on the clay surface. Tests on the clay body had indicated a shrinkage of 9.72 per cent and a shrinkage rule (see Figure 9, page 16) was developed to project the drawing to the proper size. The dimensions were figured to be fifteen feet, three inches, in length, nine feet, nine and three-quarters inches,



FIGURE 8

HEAD OF LUTHER, TEST SCULPTURE ON SIX TILES

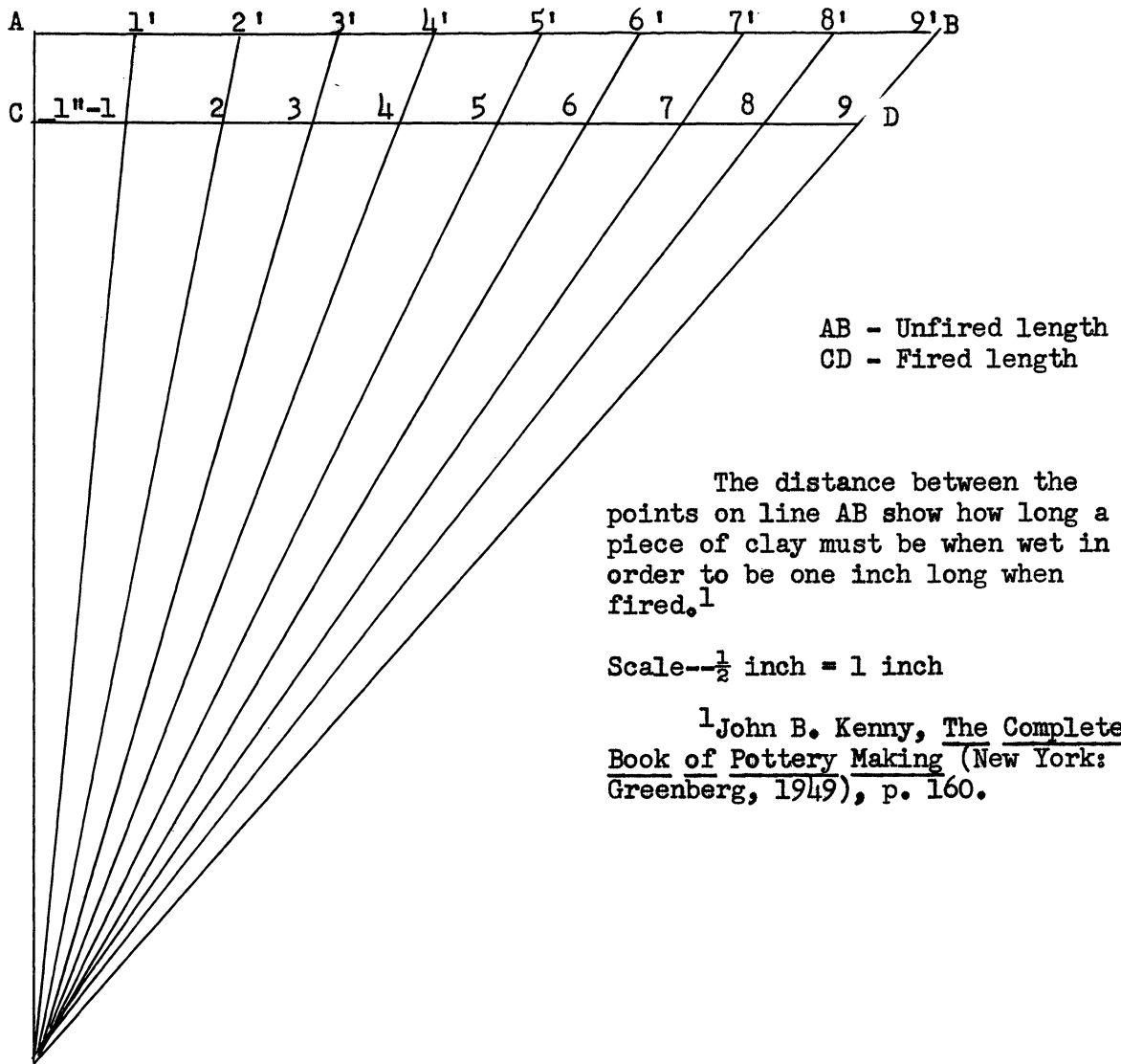


FIGURE 9

SHRINKAGE RULE

in height on the smaller side, and twelve feet, one-half inch, on the high side.

The cartoon was sketched out on the floor and then hung at approximately the correct height in order to evaluate the design from various viewpoints and distances. No important changes were found to be necessary, but details, particularly of faces and hands, had to be clarified and strengthened. Some lines were eliminated or others added to make the design more harmonious or to emphasize linear qualities (see Figure 10, page 18).

In summary, this treatment of the design has fulfilled the various basic requirements set up for the project: consistency with the architecture of the church building and with the function of the Fellowship Room; solution of the irregular wall area; presentation of a dramatic moment in the life of Martin Luther and in church history in a style compatible to the church and to the artist; and solving the technical problems of a construction of this type and size.

CHAPTER III

ANALYSIS OF THE PROJECT

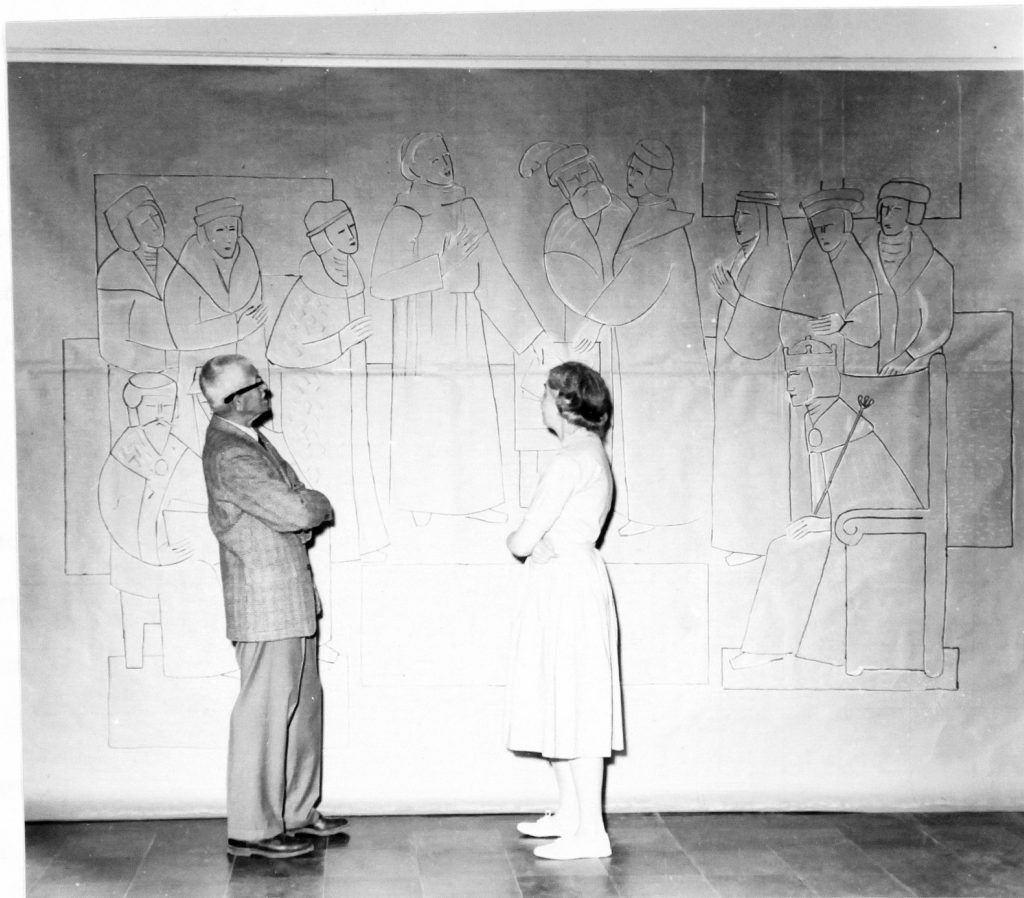


FIGURE 10

FULL SIZE WORKING CARTOON

CHAPTER III

EXECUTION OF THE PROJECT

To solve the many technical problems involved in the construction of a large ceramic tile mural, much testing of materials had to be done prior to the actual execution of the project. It was necessary to find out which materials were most satisfactory and would give consistently reliable results so that the finished product could be accurately anticipated in respect to the flatness and shrinkage of the fired tiles, the colors of the engobes and the fired clay, and the overall glaze effect.

I. THE CLAY BODY

A clay body good for sculpture or tiles must have certain characteristics in order to insure a satisfactory completed project. The clay should dry out rapidly and safely without cracking; it should fire safely without blowing up at the start of the firing. Grog, fire clay, or sand will give these properties to a body. A degree of plasticity is also necessary in order to handle the clay while modeling, carving, or applying texture. This plasticity can be secured by the addition of the highly plastic ball clay. The optimum mixture for the qualities desired can be secured by testing samples for warpage, cracking, shrinkage, and vitrification. A rich, warm-looking clay body was desired for the mural wall, so a local Missoula clay, containing iron and other impurities, from the airport west of town was added to the clay formula. Sand was

used to provide texture and additional color as well as porosity. After several combinations were tested for all these desired qualities, the following clay body was selected:

20# Local Airport Clay
 30# Local Missoula Sand--20 mesh
 50# Kentucky Ball Clay
 50# Denver Fire Clay

Approximately fifteen hundred pounds of dry mix were used to complete the wall.

Clay shrinks as it dries and still more when it is fired. It was necessary to know the shrinkage of the clay with which the mural was constructed in order that the completed project would be the correct size. Two methods of calculating shrinkage were employed to insure accuracy. Both methods were based on the nine inch square tile which was the unit of construction of the project. The first test was based on this common formula:

$$\text{Percent linear shrinkage} = \frac{\text{Plastic length} - \text{Fired length}}{\text{Plastic length}} \times 100^1$$

$$\frac{22.86 \text{ cm (9 in.)} - 20.6375 \text{ cm (8}\frac{1}{2} \text{ in.)}}{22.86} \times 100 = 9.72\%$$

The linear shrinkage was 9.72% when the test was fired at cone 5.

The shrinkage rule method (see Figure 9, page 16) confirmed the results of the first test. The linear measurements of the mural area were refigured to allow for the calculated shrinkage factor.

¹Daniel Rhodes, Clay and Glazes for the Potter, (New York: Greenberg, 1957), p. 200.

II. ENGOBE COLORS AND GLAZE

An engobe, or a slip, is a layer of clay, usually colored by mineral oxides, which is applied to the surface of clay to add color and decoration. To be suitable an engobe must have certain characteristics: that it covers the clay sufficiently, that it stays on the clay surface during drying and firing without cracking or peeling, that it does not dissolve into the glaze or cause the glaze not to fit the body. A number of engobe formulas were tested, and this formula calculated by Carleton Ball was found most desirable for applying on wet clay as was necessary in the construction of the wall.

<u>Ball No. 6</u>	
Feldspar	10.0
Talc	10.0
Ball Clay	20.0
Kaolin	30.0
Flint	25.0
Borax	5.0

In order to secure an adequate range of colors for the mural wall, numerous color tests were made. The following were those selected to use in the design:

Manganese dioxide	6%	light tan
Black nickel oxide	2%	light grey
Manganese dioxide	10%	medium yellow brown
Iacco brown	20%	rich medium brown
Barnard slip	40%	dark brown
Red iron oxide	2%	
Cobalt oxide	$\frac{1}{2}\%$	
Chrome oxide	$\frac{1}{2}\%$	blue green
Chrome oxide	5%	
Yellow stain	10%	yellow green
Rutile	6%	
Zircopax	7%	yellow
Copper oxide	2%	
Nickel oxide	1%	yellow grey green
Chrome oxide	1%	
Yellow stain	10%	light yellow green

Copper carbonate	5%	
Zircopax	5%	light grey green
Copper oxide	3%	
Zircopax	5%	light green
Crimson stain	20%	grey
Zircopax	10%	white
Albany slip	--	rich deep brown

The glaze selected is one used on sculpture in the ceramics department at Montana State University. This clear, transparent lead glaze is listed by Carleton Ball, University of Southern California, in his mimeographed material on glazes; it is a simple formula, commonly used. It has a wide firing temperature range from cone 08 to cone 5. It was decided to use a very thin, sprayed coat applied on the wet clay to avoid the glassy surface often found in low-fire lead glazes and to provide just a sealer for the engobe colors. Cone 5 (1180°C. or 2156°F.) was found to be the temperature at which the glaze was satisfactory and the clay body was sufficiently matured to provide a good tile for mural construction.

Lead Glaze - c/08 - c/5

White lead	1950.0
Flint	600.0
Cornish stone spar	450.0

III. WORKING PROCEDURES

A large transite easel, tilted at about an eighty degree angle, was installed in the sculpture studio of the pottery building. The easel measured sixteen feet in length by six feet in height, necessitating two loadings of clay and the working of the mural design in two separate sections. Enough clay was mixed (see Figure 11, page 24) to load the easel and was stored in plastic wrapping to keep it in a thoroughly moist state. This clay was mixed fairly wet to facilitate

loading the easel. As each handful of clay was thrown against the transite, it was worked with the fingers into the clay already in position. The depth was measured and the surface was troweled to push the clay solidly together and even the surface (see Figure 12, page 24).

When the entire easel was loaded, predetermined squares were marked with a chalk line and then cut. It was necessary to do the cutting immediately so that the tiles could begin to dry without cracking. Half of the working cartoon was positioned over the tiles on the easel, and the design was traced into the wet clay with a stick. The surface lines were then cut in, areas were modeled, and texture was applied (see Figures 13 and 14, page 25). The lighting in the studio area was adjusted to duplicate as closely as possible the lighting in the Fellowship Room of the church so that the proper accents could be obtained in the modeling process.

The engobe colors were painted on (see Figures 15 and 16, page 26) and a thin application of glaze was sprayed over the entire clay area (see Figure 17, page 27). During the period when the mural was being worked, the tiles had been covered with a plastic sheet, but after glazing this was removed to allow the clay to dry and the tiles to release from the easel. They were then removed, numbered on the back, and stacked on edge to dry (see Figure 18, page 28). This procedure was duplicated for the second half of the mural. After all of the tiles had dried for about three weeks, they were stacked in the gas kiln in the pottery (see Figure 19, page 28) and watersmoked for about twenty-four hours under low heat. The door was then closed, left over-night, and the kiln fired off to cone 5 the next day (see Figure 20, page 30). The kiln was allowed to cool for another day, then unloaded.



FIGURE 11
MIXING THE CLAY

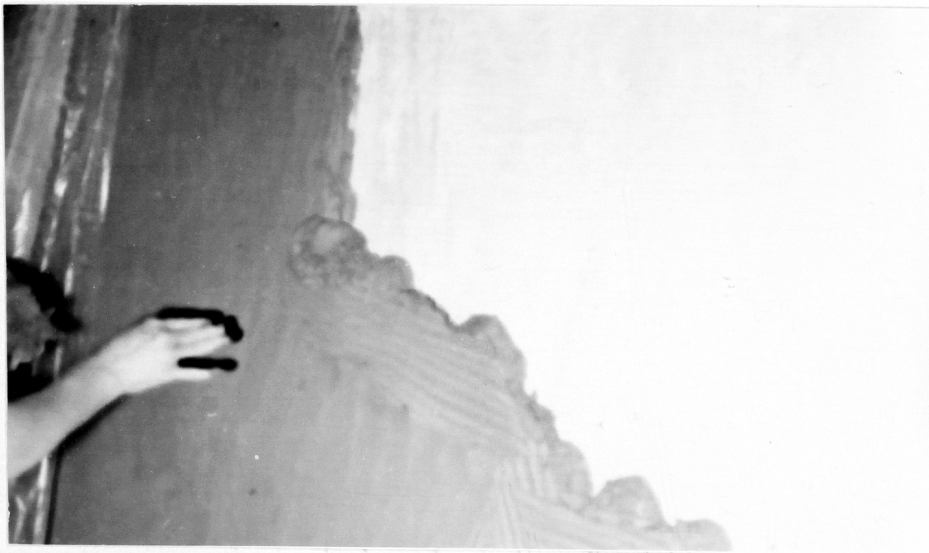


FIGURE 12
LOADING THE EASEL



FIGURE 13
CARVING THE DESIGN

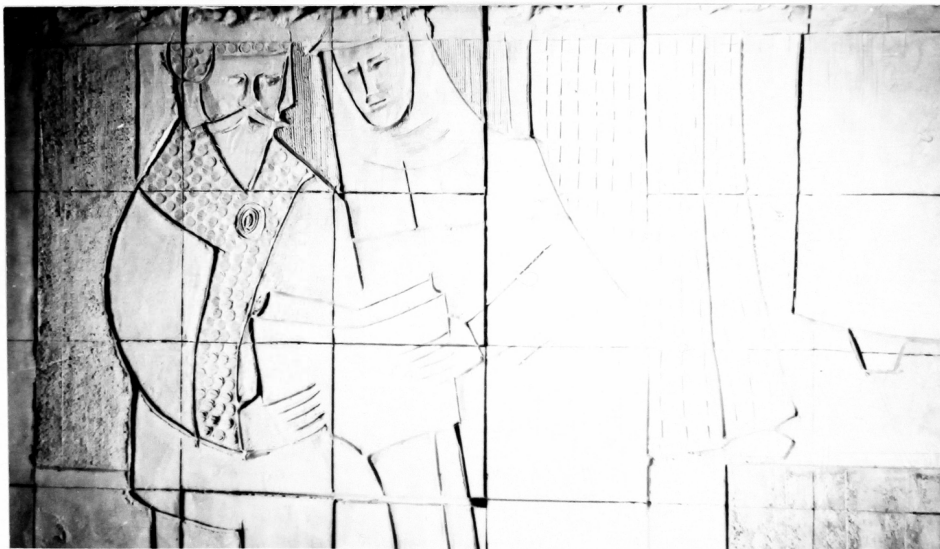


FIGURE 14
SURFACE TEXTURE



FIGURE 15

APPLYING THE ENGOBE

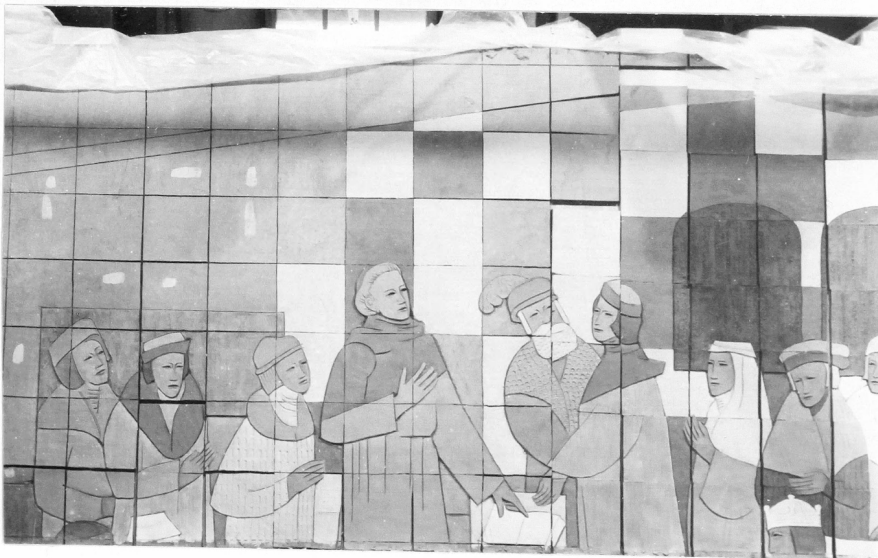


FIGURE 16

ENGOBE ON THE DESIGN

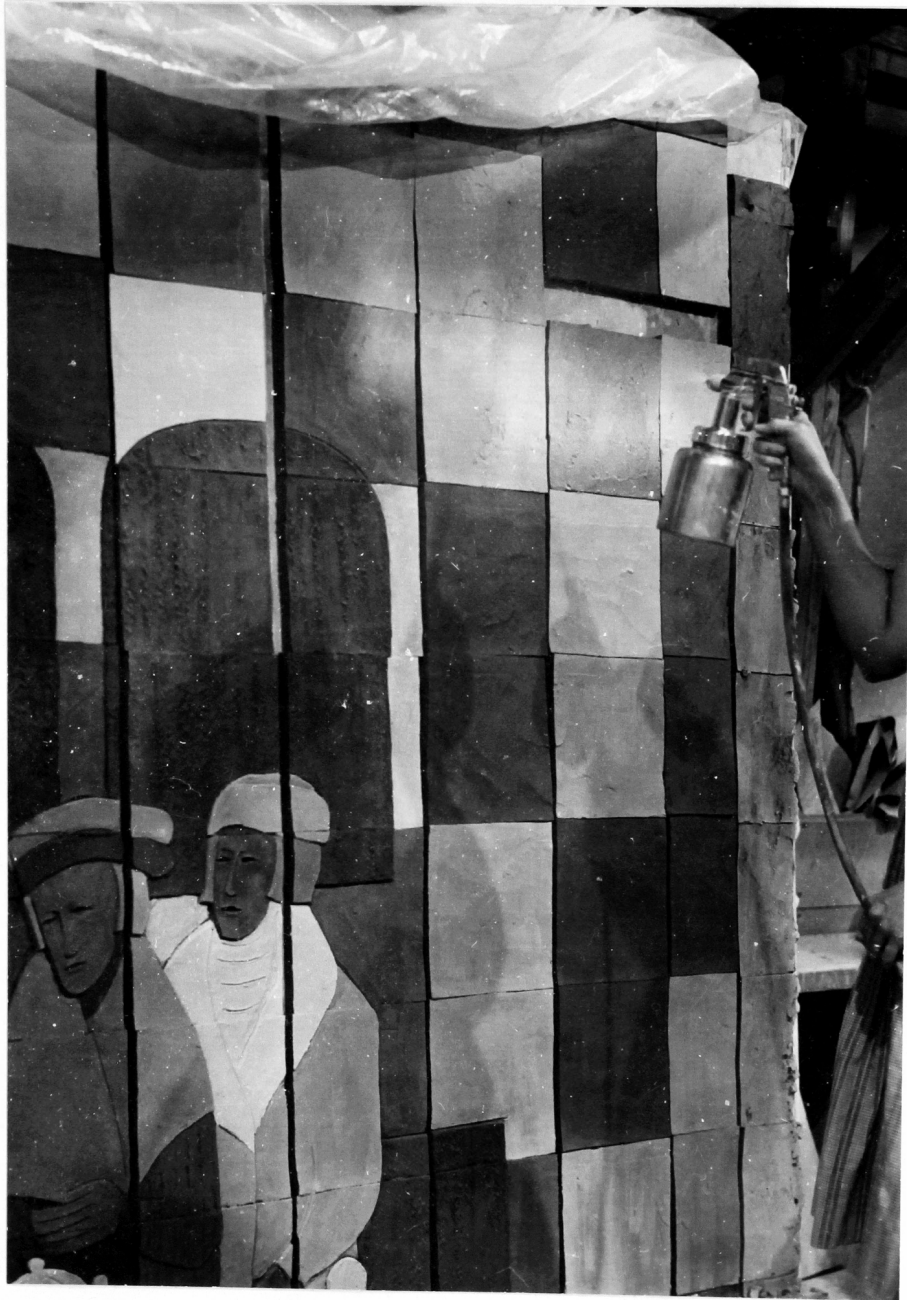


FIGURE 17

SPRAYING THE GLAZE



FIGURE 18

TILES STACKED FOR DRYING



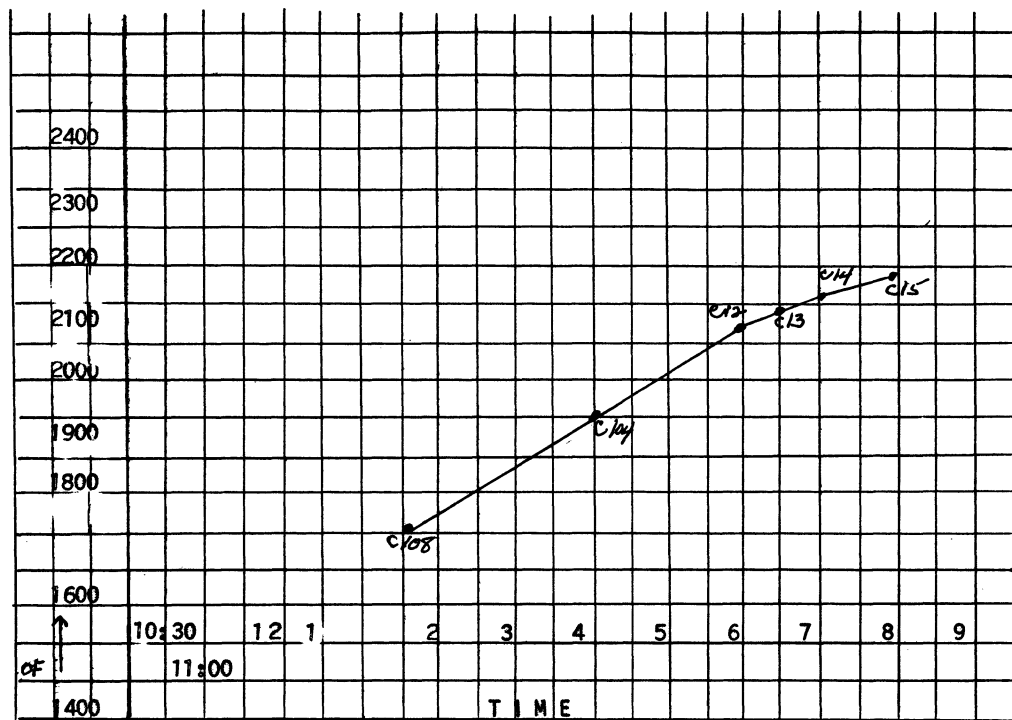
FIGURE 19

KILN STACKED FOR FIRING

IV. INSTALLATION

It had been decided that the mural tiles should be affixed to one-half inch plywood panels which would then be secured to the west wall of the Fellowship Room by fastening to wall supports. The plywood sheets were cut into pieces that could be easily handled and that would fit the wall area.

A product of the 3M Company, CTA 11, which is a commercial tile adhesive for walls, was used to mount the tiles on the plywood (see Figure 21, page 31). The tiles were arranged to overlap the joinings in the plywood both for strength and appearance. To grout the tiles after installation, Portland Cement, greyed slightly with black iron oxide, was applied using a plastic squeeze bottle.



	TIME	C	P	CONES	DAMPER	REMARKS
first day	9:00 PM		$\frac{1}{2}$ "		half-closed	door open
second day	10:00 AM					door on rest
	2:15 PM				set at $1\frac{1}{2}$ "	door closed
	4:00		1"			
	6:00		2"			peep holes closed
	10:00		3"			
third day	9:00 AM		4"			cherry red heat
	9:45		5"			
	10:15		6"			
	10:45		7"			
	11:15		8"			
	11:45	9"	9"			
	1:40 PM			c/08		
	4:00			c/04		
	6:00			c/2		
	6:35			c/3		
	7:05			c/4		
	7:55			c/5	closed	kiln off
	10:00				open $1\frac{1}{2}$ "	

FIGURE 20

GRAPH OF THE KILN FIRING

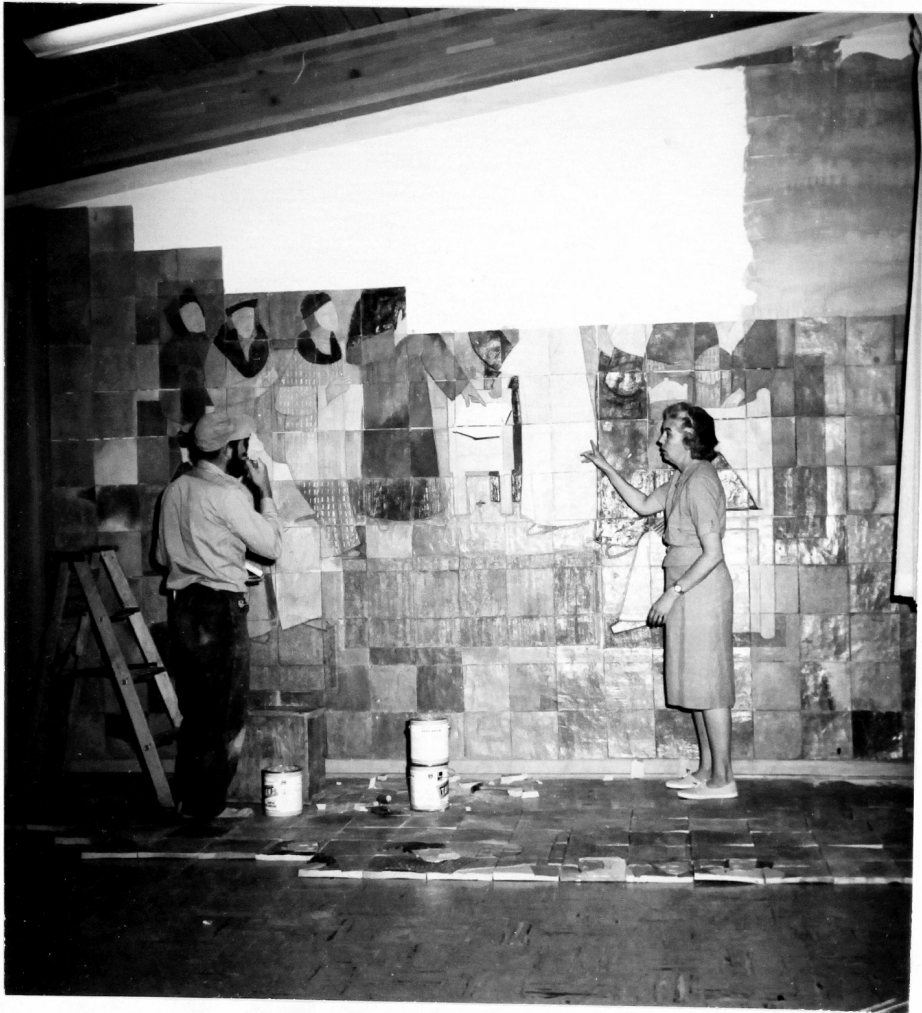


FIGURE 21
MOUNTING THE TILES

CHAPTER IV

APPRAISAL OF THE PROJECT

After a project of this type is completed, an evaluation can be made as to the success of the methods and materials used in construction. The work can also be appraised as an artistic solution to the various factors and implications of the problem, in this case as set forth in Chapters I and II.

I. THE TECHNIQUES AND MATERIALS USED IN CONSTRUCTION

No particular difficulties were encountered in the construction of the mural. The clay body worked exceptionally well both on the easel and in the firing process. The engobe colors held up well and enhanced the natural warmth of the fired clay. The glaze formula used was quite satisfactory; however, other glazes might also have worked well.

II. THE COMPLETED MURAL AS AN ARTISTIC SOLUTION

TO A PROBLEM

Several basic requirements or implications were apparent as this project was begun. The Luther ceramic mural necessarily had to be harmonious in style and treatment with the architecture of the church building and the function of the room. It also had to present the drama of the theme in a manner meaningful to the church congregation. The completed mural (see Figure 22, page 33) has met these requirements as



FIGURE 22
THE COMPLETED MURAL

well as that of being a design consistent as a whole in its use of color, line, shape, and texture. Thus it is felt this mural has succeeded as an artistic solution to a problem.

One outstanding value of a project of this type is the experience and knowledge gained in carrying through to completion a work which presents so definite a challenge in its requirements. It has been an excellent background experience for further efforts in the field of architectural sculpture.

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